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ACTION-BASED LEARNING IN CULTURE

A Cultural Perspective of Action-Based Learning by Infants and Young Children

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Abstract

Decades of research have informed about ways in which infants and young children learn through action in connection with their sensory system. However, this research has not strongly addressed the issues of cultural diversity or taken into account everyday cultural experiences of young learners across different communities. Diversifying the scholarship of early learning calls for paradigm shifts, extending beyond the analysis at the individual level to make close connections with real-world experience while placing culture front and center. On the other hand, cultural research that specifies diversity in caregiver guidance and scaffolding, while providing insights into young learners' cultural experiences, has been conducted separately from the research of action-based cross-modal learning. Taking everyday activities as contexts for learning, in this chapter, we summarize seminal work on cross-modal learning by infants and young children that connects action and perception, review empirical evidence of cultural variations in caregiver guidance for early action-based learning, and make recommendations of research approaches for advancing the scientific understanding about cultural ways of learning across diverse communities.

Keywords: Infancy, early childhood, action-based learning, parental guidance, culture

Word count (including references): 13,197

1. Introduction

Starting in early years, children learn through action, in connection with the sensory system, in everyday contexts often with more knowledgeable others. To clarify the mechanisms underlying early learning and identify practices that foster it, research must connect different facets of learning, including action and cross-modal integration, everyday practices, and guidance from others. Advances have been made to delineate the relations between action and the sensory system; however, research that connects action-based cross-modal learning with cultural experiences in infancy and early childhood is still limited. Diversifying the scholarship of early learning calls for paradigm shifts, extending beyond cognitive analysis at the individual level to make strong connections with real-world experience while placing culture front and center.

The purpose of this chapter is to connect the seminal research of action-based learning by infants and young children with cultural studies of caregiver guidance in contexts for learning. In doing so, we first review selected work that informs the theories of action-based cross-modal learning in infancy and early childhood. Next, we review research on caregiver guidance and scaffolding as an important facet of cultural practices that children routinely engage in and co-enact in everyday contexts. We focus on empirical work that examines the role of cultural experiences in early action-based learning and exemplify some fruitful approaches for bridging research on early learning and sociocultural aspects of child development. Finally, we expand the review to a wider array of everyday contexts for learning and make recommendations of research approaches for examining cultural ways of learning in diverse communities.

2. Learning through action

2.1 The role of action in cross-modal learning

Developmental psychologists have long emphasized the role of exploratory action on perceptual and cognitive development. Piaget and Inhelder (1948/1956) believed that sensorimotor experience is the root of all basic knowledge about the physical world and specifically highlighted the role of motor activity in learning about objects. Gibson (1988) considered action as a means to acquiring new information. Thus, as opportunities for exploration emerge, infants and young children gain and refine their knowledge about the world. Other scholars have also underscored action-based experiences in theorizing early cognitive development (e.g., Bruner et al., 1966).

One example reflecting this broad perspective is the research linking the development of spatial perception with the emergence of self-locomotion in infancy. Sitting upright, crawling, and walking allow infants to explore the world in a new and meaningful way (Acredolo et al., 1984; Bushnell & Bourdreau, 1993). Self-locomotion has been shown to influence infants' sensitivity to height (Campos et al., 1992), their ability to search for hidden objects (Bai & Berthenthal, 1992), and their representation of objects. In particular, sitting upright independently contributes to the emergence of perceptual completion (Soska et al., 2010), whereas crawling elevates infants' mental-rotation abilities (Schwarzer et al., 2013). In these cases, spatial perception is enhanced as infants become better at attending to the object at hand while exploring the world actively, which fosters the integration of information from different modalities.

In the same vein, embodied cognition research stresses the importance of integrating information from action and the sensory system and argues that infants rely on multidirectional flows of information across modalities when learning about objects in the world (Gibson & Pick, 2000; Smith & Gasser, 2005). Research on spatial thinking and tool use has supported this claim,

highlighting the role of action experience (e.g., Gibson, 1988; Sommerville et al., 2008). For example, looking at objects while playing with them helped 10.5-month-old infants track objects by color, whereas being passively shown objects did not (Wilcox et al., 2007). Converging evidence supports the importance of visual-motor integration: visual information generated by one's own action facilitates object tracking more so than information generated by others.

Neuroscience research provides further evidence for the key role of action in human cognition. Robust findings have indicated that the brain processes self-generated and other-generated information differently. For example, auditory information generated by 5-year-olds' own action recruits motor systems and activates different parts of the brain from auditory information generated by others (e.g., James & Bose, 2011; James & Swain, 2011). More generally, neural pathways have been specified for multisensory integration. For example, the dorsal and ventral pathways, traditionally thought to separately represent "where" and "what" information, are considered to process information for the purpose of action and object recognition, respectively (e.g., Goodale & Milner, 1992; Harman et al., 1999; Johnson et al., 2001). Furthermore, these pathways are shown to interact more than traditionally thought, supplying each other crucial information. Specifically, the dorsal system specializes in motor-related information, such as information about whether and how an object can be grasped; the ventral system, while specializing in object-identity information, may supply information to the dorsal system for action planning or motor execution (e.g., Almeida et al., 2010). Through the dorsal-ventral interplay, the development of visual perception goes hand in hand with children's active exploration in the world. This view has been supported by empirical evidence for the relations between object play, object recognition, and word learning in childhood (e.g., James et al., 2013, 2014; Rosenbaum et al., 2012; Street et al., 2011).

The notion of a strong link between action and perception was once challenged by the

findings that infants succeeded in looking tasks, whereas toddlers would fail in action tasks that required them to apply the same concept (e.g., Berthier et al., 2000; Hood et al., 2000; Keen, 2003). The discrepancies between looking and action tasks led to the debate about whether action and perception operate as separate systems or draw upon a shared representational system. Subsequent research has converged to support the shared-system perspective. With careful controls of task demands, infants can succeed in both looking and action tasks (e.g., Hespos & Baillargeon, 2006; Keen & Berthier, 2004; Wang et al., 2005; Wang & Kohne, 2007). Therefore, the discrepancy in infants' and toddlers' performance was derived from different task demands. Moreover, learning in one modality was shown to transfer to infants' responses in another modality (e.g., Needham, 2000; Needham et al., 2002; Wang & Kohne, 2007). For example, manual exploration affected infants' perception of goal-directed actions by others (e.g., Sommerville et al., 2005), and infants' own grasping action influences their perception of others' grasping action (Loucks & Sommerville, 2012).

As mentioned earlier, motor development such as the onset of independent locomotion is associated with benefits in perceptual and cognitive development (e.g., Gerhard-Samunda et al., 2021; Iverson, 2022; West et al., 2023 for recent reviews). For example, the locomotor status of 8-month-olds predicted whether they were able to track the location of a hidden object and to search for it after they were moved around the table (Bai & Bertenthal, 1992). Studies that manipulated infants' action experience experimentally have also shown that active movement, such as crawling or walking, facilitated 10- to 12-month-olds' performance in spatial search tasks (Acredolo et al., 1984; Benson & Uzgiris, 1985). There is also evidence that representation of object rotation can be improved if infants are allowed to touch the to-be-rotated object before the test (Frick & Wang, 2014; Möhring & Frick, 2013). In addition, research with children and adults converged to show that action experience positively affects mental transformations of objects. For example, hand

movements, or even just hand gestures, have been shown to affect the ability to imagine an object rotation in children (e.g., Ehrlich et al., 2006; Frick et al., 2009). Furthermore, neuroimaging data suggests that the parietal lobe plays an essential part in mental spatial transformation (for reviews see e.g., Jäncke & Jordan, 2007; Mast & Newby, 2007). The parietal lobe has been associated with transforming sensory input into motor output; most notably, it is thought to be responsible for visuo-spatial processing and manipulation of objects (Fogassi & Luppino, 2005). As infants pair visual exploration with manual experience (Eppler, 1995), they form a visual-haptic map of the objects they encounter (Bahrick et al., 2004; Ruff, 1989). Mapping information in this cross-modal fashion allows infants to direct their attention to relevant information for perception and action planning. Thus, infants benefit from action experience through integrating information from multiple modalities.

The benefits of action experience in early learning can be driven by another mechanism related to the agentic role of learners. Infants showed greater sensitivity for navigation after they had accumulated experiences with moving on their own than after they have been carried around (e.g., Campos et al., 2000). Active control of exploratory play has also been argued to account for the effect of motor experience on object perception in infants (e.g., Soska et al., 2010). In other words, infants benefit from active movement with concurrent perceptual feedback, a notion that is in line with an ecological view of perceptual development (Gibson & Pick, 2000). This mechanism is particularly tied to the specific opportunities that young learners have on hand in everyday lives and the cultural context that they are immersed in. For example, children growing

up in the culture that values school readiness versus natural exploration would be encouraged to engage in different kinds of activities (e.g., drawing with crayons versus stacking rocks and sticks), thereby accumulating a different mix of action-based experiences (Casey et al., 2022). The diverse contexts for everyday activities make it necessary for research to extend beyond the individual level and consider the sociocultural aspect of action-based learning.

2.2 Learning in everyday contexts

Focusing the research of action-based learning in the contexts of everyday activities and routines can clarify the mechanisms underlying how infants and young children make sense of cross-modal information and polish their intuitive understanding about the world. The regularities of the daily activities and routines provide a helpful structure to learning (Custode & Tamis-LeMonda, 2020; Tamis-LeMonda & Masek, 2023; Tamis-LeMonda & Song, 2012). It is also important to note that the activities in which infants and young children engage are related to cultural ways of organizing family life. For example, in some communities, book reading may be a regular activity before bedtime. In other communities, different language activities like oral storytelling, rather than book reading, may happen routinely and unfold in regular, predictable patterns to support learning (Heath, 1982b; Wang et al., 2021). Likewise, object play in some communities may frequently involve toys designed specifically for children, whereas in other communities, infants and young children may often manipulate natural objects like leaves and sticks (Casey et al., 2022). Mealtime too can look different from community to community. In some communities, young children may sit in a high chair at a table with caregivers to eat meals, whereas in others, this activity may involve young children (e.g., children around 3-4 years old) feeding their younger siblings (Martini & Kirkpatrick, 1992).

Across cultural contexts, however, the regularities of everyday recurring activities, combined with children's agency and their collaboration with caregivers and siblings (Tamis-

LeMonda & Masek, 2023), provide a stable structure for cross-modal learning about the objects in their environment. In the next section, we review empirical work that has investigated cultural ways of action-based learning in infancy and early childhood, take stock of frequently observed recurring activities as opportunities for early learning, and make recommendations of strategies for future research to connect action-based learning with everyday cultural contexts.

3. Cultural ways of learning

3.1 Caregiver guidance and scaffolding

From a sociocultural perspective, caregiver-child interaction plays an integral role in supporting children's engagement in learning and psychological processes (Vygotsky, 1978), including solving problems and acquiring complex concepts. Different activities expose infants and young children to different kinds of support from more knowledgeable others. For example, when building a castle with blocks, caregivers might engage children in the use of descriptive language (e.g., "put this block on top of that one") and metaphorical language (e.g., "this castle is as big as a mountain"). Even infants readily respond to linguistic opportunities when playing with their parents (e.g., Tamis-LeMonda et al., 2008). Furthermore, these language experiences facilitate analogical thinking (e.g., Richland & Simms, 2015), allowing children to tackle challenging problems.

How do children learn by participating in everyday activities with more knowledgeable others? Rogoff (1990, 2003) calls this collaborative learning process "guided participation." The process of guided participation involves "mutual structuring" and "mutual bridging of activities" (Rogoff, 2003). Mutual structuring refers to how people work together to arrange the situation, content, and method of learning, whereas mutual bridging of activities refers to how people communicate and coordinate efforts to work together. Scholars have argued that the process of guided participation is influenced by the community's ways of learning (Rogoff, 2003), parental ethnotheories (Harkness & Super, 1996; Harkness et al., 2009), and other historical, political, and

philosophical traditions. Therefore, the way caregivers guide children's participation in everyday activities unfolds in a culturally variable fashion. In the sections below, we zero in on a prevalent context for learning in infancy and early childhood, object play, to review empirical work on cultural ways of learning through exploring objects.

3.1.1 Context of object play

Cultural research on early action-based learning has greatly focused on the context of object play. A naturalistic home-visit study, done mostly with White, highly-educated mothers and their 13- to 24-month-old infants, found that the infants spent about 60% of the two-hour home visits manipulating objects (Herzberg et al., 2022). That number was fairly consistent across age groups, and babies spent about the same amount of time playing with toys as they did with other household objects. In addition, these instances of play were often less than one minute long and were broken apart by short breaks. This particular pattern of object interaction is well suited for infant learning because it provides infants with many short segments of attentively interacting with objects as well as time to process newly learned information.

What do infants learn when they play with objects? Object play is associated with multiple areas of development, including but not limited to language development, understanding the intended functions of objects, and causal learning. In a study, 14-month-old infants from Mexican, Dominican, and African American families engaged in two tasks, book reading and bead stringing, with their mothers. Consistency was observed in the actions that infants and their caregivers made during the tasks: When the infants engaged in object exploration, the mothers were more likely to engage in object exploration themselves while using teaching language. The pattern of caregivers and infants joining in similar actions was linked to infants' language learning (Tamis-LeMonda et al., 2013). Additional research confirmed that infants are more likely to learn words for the items they regularly interact with, and they learn even more

efficiently when caregivers join in infants' exploration by gesturing, labeling, and manipulating objects alongside them (Suarez-Rivera et al., 2022; Tamis-LeMonda et al., 2012). Object play, especially joint object play, thus constitutes a powerful context for learning that involves multimodal experiences; in the above cases, when the caregiver labels an object being manipulated by the infant, the activity provides tactile, visual, and auditory information about the object. Furthermore, when this happens in routinely occurring activities, infants are provided with a stable structure for word learning (Custode & Tamis-LeMonda, 2020). Manual exploration, visual information, and auditory exposure to speech sounds allow infants to integrate their cross-modal experiences to learn new words. Crucially, this action-based learning is moderated by caregiver guidance that could vary from community to community.

Another form of learning promoted by object play is building accurate expectations of how physical objects work and interact with one another and attending to important properties of everyday objects that determine the outcomes when infants act on them (e.g., Nedham, 2000; Stahl & Feigenson, 2015; Zhang & Wang, 2020). As with word learning, infants seem to learn more about object properties when learning is a joint endeavor with caregivers. For example, a naturalistic home-visit study with 13- to 24-month-olds found that when mothers engaged in object exploration with the infants, especially when mothers talked about actions associated with the objects, the infants played with objects longer and tended to engage in more diverse actions, including exploring their functional and symbolic uses (Schatz et al., 2022). As infants observe their caregivers using objects while interacting in various ways (goal-directed or not) with objects, their engagement in object play provides multimodal information that can be synthesized with motor and physical development into learning about proper or effective behaviors to engage with the physical world (see Rachwani et al., 2020).

In addition, research on causal learning has shown that preschool-aged children tend to

explore objects most when they are not sure how the objects work and that this exploration can illuminate causal relations embedded within those objects (Bonawitz et al., 2012; Cook et al., 2011; van Schijndel et al., 2015). Although cognitive developmental research often portrays causal reasoning as a universal, individual process, causal learning happens as children engage in activities with others in sociocultural contexts. In a study conducted by Basch and Wang (2024b), children from 3 to 5 years old and their caregiver played with a “Blicket detector,” a box that would light up when certain objects or combinations of objects are placed on the detector (e.g., Gopnik & Sobel, 2000). In the first part of the study, Basch and Wang (2024b) gave the caregivers and children ample time to experience the Blicket detector working consistently with a causal rule, for example, blue objects always make the Blicket Detector activate. In the second part of the study, the detector stopped working consistently according to the causal rule demonstrated before. The inconsistency led the caregivers to engage in more verbal scaffolding such as asking for or giving explanations, vocally highlighting the causal inconsistency with surprise, and suggesting children retest the objects. These practices can facilitate behaviors known to promote causal learning for children, such as generating explanations (Legare, 2012) and noticing learning moments when causality is unclear (Schulz & Bonawitz, 2007). However, as will be clarified later, verbal guidance and scaffolding for infants and young children can vary from community to community.

3.1.2 Caregiver guidance in object play

One way guided participation unfolds in infancy is through responsive caregiving, which seems to be universal and contributes to infants’ action-based cross-modal learning. For example, in White middle-class communities, when infants touch an object, mothers tend to respond by talking about that object and manipulating that object themselves. This provides targeted multimodal stimulation for the child to learn through tactile, visual, and auditory processes about

the object in their immediate field of vision. Although caregivers are generally responsive to infants' actions, there are some cultural specificities, for example, in how caregivers engage their children in object manipulation. An experiment by Little et al. (2016) compared mother-infant object play in the U.S. and the Ni-Van communities in Vanuatu. In the Ni-Van communities, families were involved in agriculture and had less formal schooling than the U.S. sample. In this experiment, researchers gave the mothers and one-year-old infants a novel toy to play with for three minutes. Mothers in both cultural groups were equally responsive to their infants' action on the object. For example, within one second of the child touching the object, the mother would touch the same object. Mothers in both groups were also equally likely to respond to infants' object play vocally. However, the *modality* of these contingent responses made by caregivers to maintain shared attention differed across the two groups. In the U.S. group, mothers responded by positioning themselves so that they could see infants and maintain shared attention. The Ni-Van mothers responded more frequently by repositioning infants. In other cultural communities, contingent responses may differ along other dimensions, with some cultural communities responding with varying levels of talks or gazes (see also Abels, 2020; Bornstein et al., 2015; Kartner et al., 2008).

Caregivers use both verbal and nonverbal communication to highlight important features of the child's environment in ways that encourage the child to engage in object play in culturally valued ways. For example, in a community in Guatemala, mothers supported young children's exploration of objects with wide-span attention to readily respond to any nonverbal cues from children (e.g., Rogoff et al., 1993). In this Mayan communities as well as in some Somoan and Inuit communities, caregivers would encourage young children to pay close attention to those around them (Briggs, 1991; Mejia-Arauz et al., 2012; Ochs & Schefflin, 2011; Rogoff et al., 1993). These children therefore receive cross-modal information through attention to the actions

of others which can help focus and guide their manipulation of objects in everyday activities.

Indeed, for children in these communities, their skills in observing others are empirically shown to result in wider-span attention, allowing children to learn from situations when they are not directly addressed to, for example, when instructions are given to other children (Correa-Chavez & Rogoff, 2009). The development of keen attention to surrounding actions and sensory information even when they are directed towards others is argued to support the development of complex and synchronistic fluid collaboration with others. This is a strength for learning that would allow greater integration of perception and action with others seamlessly, for example, by visually and tactically completing tasks together using verbal and complex nonverbal communication (Alcala et al., 2018). In the next section, we look more closely at verbal practices and nonverbal practices that have provided researchers with insights into cultural variations in early learning.

3.2 Cultural practices and variations

3.2.1 Verbal practices

For verbal practices, we focus on scaffolding language as talk that supports a child's participation in a task that would be otherwise outside their ability, thereby encouraging the child's learning (see Shvarts & Bakker, 2019). The study of scaffolding language has a long history in the field of child development, and as with other domains of developmental research, studies are by and large conducted with European American highly-schooled families. However, scholars have underscored the need to study the scaffolding language practices of families from more diverse cultural communities, SES, geographic locations, ethnicities, and so forth (e.g., Graham, 1992; Hartmann et al., 2013; Henrich et al., 2010; Rowley & Camacho, 2015).

It is crucial to highlight cultural diversity in the use of scaffolding language with infants

and preschool-aged children. For example, many studies suggest that pedagogical questions are supportive to children's learning (Daubert et al., 2020; Yu et al., 2018); however, these studies have been conducted primarily with families who value such practices. The practice of asking young children pedagogical questions is common in many middle-class families in the U.S. and is connected to practices and ethnotheories around how young children learn (Rogoff et al., 1993; Yu et al., 2019). These questions may help children hone-in to important aspects of their environments; even young infants are already sensitive to questions and treat them as distinct from other speech acts (Frota et al., 2014; Soderstrom et al., 2011). Through the rising contour of a question, question-asking may focus infants' attention to certain events (e.g., Gussenhoven, 2004).

However, question-asking has been shown to take different forms in different cultural communities (e.g., Crago et al., 1993). Heath (1982a) found that White middle-class mothers in a southeastern town of the U.S., who themselves were teachers, tended to ask their toddlers many known-answer questions at home. Yet in another neighborhood, African American parents tended to ask their children a wider variety of questions, including "story-starting" questions. The story-starting prompts mirror the elaborate linguistic experiences of children from working-class families and other cultural communities (Cho & Miller, 2004; Lin et al., 2012; Miller et al., 2005; Miller & Fung, 2012).

As another example, Basch et al. (2024) found cultural differences in maternal use of questions to scaffold their preschool-aged children's problem solving. In the study, Chinese-heritage mothers and European-American mothers and their 2.5- to 4-year-old children did two activities together. In a puzzle task, the dyads worked together to arrange blocks to match a configuration on a picture card. This task had a clear end-goal. In the other activity, the dyads were told to sort a set of balls however they wanted; thus, this task was more open-ended with no

right answers. Mothers spontaneously asked their children many questions as they did these activities together—a common way to scaffold children’s participation. Four types of questions were observed and coded (see Table 1) with the results demonstrating cultural variations in question asking.

When collaborating on a puzzle with a clear end-goal, Chinese-heritage mothers used more instructional questions than European-American mothers. These questions gave children clear indications of what to do next. For example, a mother might say “the blue goes on top, right?” In contrast, European-American mothers used more check-in questions to keep the conversation flowing. These kinds of questions involved commenting on or checking in about the child’s engagement, for example, asking “You put it there, huh?” after a child placed a piece. These patterns in question-asking reflect historical arrangements for how people in these communities tend to organize learning. In fact, the instructional questions are reflective of directive guidance (Zhang et al., 2021; to be described in the next section, nonverbal practices), whereas the observation of check-in questions is consistent with previous finding showing that middle-class European-American mothers tended to engage in running commentary as a way of promoting language development (Rogoff et al., 1993). Crucially, Basch et al. (2024) found that the cultural variations were moderated by the context of activity. When doing the open-ended sorting task, the question-asking pattern was different. Chinese-heritage mothers now used more one-right-answer questions than European-American mothers. These cross-activity differences highlight the importance of examining how mothers’ scaffolding language is informed by both cultural systems and the nature of the immediate activity at hand.

Rather than claiming that certain language practices are deemed beneficial for all children’s learning (e.g., Hart & Risley, 1995), a wealth of research has supported the view that learning can be fostered through diverse language practices (e.g., Sperry et al., 2019; Wang et al., 2021). For

example, pedagogical questions may alert infants and young children to important causal aspects of their environment in highly formally-educated middle-class communities (e.g., Ferry et al., 2010; Fulkerson & Waxman, 2007; Grosse & Tomasello, 2012; Yu et al., 2018), whereas children in other communities may be tuned in to their environments through other cultural practices (e.g., Correa-Chavez & Rogoff, 2009).

3.2.2 Nonverbal practices

Cultural ways of learning can illuminate diverse pathways to supporting children's learning, extending beyond language practices. In some communities, caregivers use skilled nonverbal communication to guide their infants. For example, Rogoff et al. (1993) found that compared to middle-class mothers in the U.S., Mayan mothers more often remained ready to assist infants in engaging in toys, and more often manipulated or gestured in synchrony fluidly and nonverbally with the child to shift their actions. The nonverbal scaffolding observed here is tied to a broader system of cultural practices, which Rogoff and colleagues termed "LOPI" (Learning by Observing and Pitching In to community endeavors; Rogoff, 2014). For communities that endorse the LOPI system as cultural ways of learning, verbal scaffolding through pedagogical questions may not be as crucial for children to tune in to aspects of objects in their environments (e.g., Rogoff et al., 1993). As such, children in the Mayan community that practices LOPI are shown to be attuned to their surrounding events without as many verbal prompts, compared to highly-schooled European American families (e.g., Correa-Chavez & Rogoff, 2009). Furthermore, children growing up in communities that practice LOPI behave in ways that reflect keen attention to nonverbal aspects of the ongoing activity and readiness for complex, fluid collaboration amongst multiple people (Chavajay & Rogoff, 2002).

Cultural variations in nonverbal scaffolding practices have also been observed when comparing caregiver guidance for infants across Asian- and European-heritage families. A good

case in point is *directive guidance* in Chinese-heritage families. Zhang, Wang, and Duh (2021) examined cultural variations in caregiver guidance when 9-month-old infants in Taipei, Taiwan and Santa Cruz, California, U.S. faced a challenging task of operating a shape-sorter toy set. The task required motor skills of inserting an object in the appropriate orientation to fit the opening and muscle strengths of pushing a bar downward to dispense the object, both of which exceeded the typical level of infants this age. While exploring the toy, the infants tended to deviate from the task and instead engaged in peripheral actions such as mouthing the toy. In this context, both the mothers in Taipei and those in Santa Cruz spontaneously engaged infants in attention management and action coordination, but they did so with different approaches.

The mothers in Taipei engaged their infant in two hallmark behaviors of directive guidance. First, they readily intervened, for example, by removing a distraction object when infants were off-task. In contrast, the European-American middle-class mothers in Santa Cruz tended to give more time for infants to continue with their action whether it was on- or off-task and waited longer before they made an attempt to intervene in an off-task action. Second, the mothers in Taipei frequently held the infant's hand or arm to perform an otherwise difficult action to make the toy work. In contrast, the mothers in Santa Cruz rarely did so. Moreover, in sparse examples of hand holding by the European-American mothers, their infants tended to free themselves from the hold of the mother. Additional results showed that although mothers from both sites made solo demonstrations of target actions without involving the infants, there was a difference between the two groups. The European-American mothers in the Santa Cruz sample did so more frequently than the Chinese-heritage mothers in the Taipei sample. Overall, Zhang et al. (2021) found that Chinese-heritage mothers in Taipei readily use hands-on, synchronous guidance to help their infants engage in a difficult task in collaborative ways.

Cultural variations have also been observed in experimental research. For example, Wang

(2024) examined cultural patterns of caregiver guidance in a laboratory setting when infants were engaged in learning about a new physical rule with hands-on experience. Nine-month-old infants watched a single exemplar of events that demonstrated a physical rule that they have not learned: An object should be fully hidden underneath a rigid cover that is as tall as or taller than the object; when the cover is shorter than the object, it should remain partly visible underneath the cover. While observing the events that instantiated the above rule, the 9-month-olds had opportunities to explore the stimuli with caregiver guidance for a total of 5 minutes. In the test phase, the infants took part in a search task designed to examine whether they had learned to pay attention to the key feature (i.e., object height) of a set of new stimuli involved in another covering event. When the caregivers attempted to guide the infants to learn the physical rule, their goal often conflicted with the infants' agenda of playing with the stimuli, creating a suitable context for examining cultural patterns of negotiating different purposes and managing young infants' attention.

Consistent with the pattern observed in the context of toy play at home (Zhang et al., 2021), Wang (2024) observed that the Chinese-heritage mothers in Taipei, Taiwan intervened more frequently than the European-heritage mothers in Santa Cruz, California, U.S. In addition, hand holding occurred more frequently and with a longer duration for the Chinese-heritage dyads in Taipei than the European-heritage dyads in Santa Cruz. Parental intervention and hand holding share the purpose of directive guidance, a cultural practice prevalent in Chinese-heritage families in Taiwan and rooted in Confucian- influenced ideologies of learning (Chao, 1994; Zhang et al., 2021).

Hand holding, one of the behavioral hallmarks of directive guidance, may be combined with culturally unique patterns of scaffolding language practices. Recall the study that compared question-asking by Chinese-heritage and European-heritage mothers in the U.S. (Basch et al., 2024). Instructional questions, such as “the blue goes there, right?” were observed more

frequently in the Chinese-heritage families. This type of questions aligns with nonverbal directive guidance shown in Zhang et al. (2021) and Wang (2024) in the sense that instructional questions aim to provide clarity of the pathway to problem solving, thereby supporting infants' and young children's emulation of proper actions and fostering their collaboration with more knowledgeable others to accomplish the task at hand.

3.3 Activity as cultural context for learning

Beyond object play, we describe four additional contexts of learning in this section. These contexts exemplify naturally occurring and frequently observed activities that infants and young children tend to engage in with caregivers: mealtime, household chores, book reading, and device-mediated activities. For each activity, we provide a brief review of research that investigates cultural aspects of learning and make recommendations for future research.

3.3.1 Mealtime

The arrangement of engaging infants and young children in eating can be variable from community to community. For example, in many middle-class families in the U.S., eating regular meals together is considered important for family togetherness; nutrition and childcare health experts also advocate that eating together is crucial for children's healthy physical and emotional development (Dallaker et al., 2018). However, there is observed variability within the U.S. in the value and ability for families to this type of mealtime arrangement. An interview study found that families with preschool-aged children tended to have different ideas about the purpose of mealtime. Some thought the purpose of regular family dinners was to teach children about nutrition, some thought it was to be together, and others saw mealtime as just a necessity (Walton et al., 2020). The physical arrangement of mealtime is also variable from community to community. In many middle-class families in the U.S., when infants begin eating solid food they are sat at a high chair. The high chair is designed to keep infants in place, unable to move away

from the activity, and is often used with a caregiver sitting near them. The high chairs are typically equipped with a large tray where infants and young children can play with and eat their food, using their fingers and child-sized utensils.

Mealtime contains important opportunities for developing motor and social skills through cross-modal action experience. During mealtime, infants and young children engage in object exploration that leads to tool use of utensils like forks, spoons, or chopsticks in culturally acceptable or valued ways. Nonaka and Goldfield (2018) conducted a study with Japanese toddlers and non-parent paid caregivers. The researchers observed that well before the infants were able to effectively use a spoon to bring food to the mouth, they tended to manipulate the spoon with actions that do not lead to eating. Nonverbal scaffolding by caregivers often occurred in these situations. For example, when caregivers saw the spoon held by infants touching food in a container, caregivers would position the container in a way that facilitated infants' effective scooping food out of the container towards eating. In this example, the caregivers engage in a form of nonverbal scaffolding that brings infants closer to the end-goal of eating given their current motor skills. In addition, Nonaka and Stoffregen (2020) found that when infants start using the spoon in intended ways, they would pay more attention to caregivers. For example, when infants brought a spoon to make contact with food, they would look at the face of the caregiver, anticipating guidance from the caregiver. In these situations, caregiver demonstration often facilitated successful action towards eating. Together, the developmental progression suggests that action, perception, and social engagement are intertwined in the process of eating, fostering infants' and young children's tool use.

Mealtime can play an important role for learning first words. For example, Clerkin et al. (2017) used head-mounted cameras to observe what 8.5- to 10.5-month-old infants saw during mealtime. They found that the infants tended to see a wide array of items during meals, and the

quantity of the entire seen items was too great for infants this age to process. However, the context of mealtime provided a structure that made a smaller set of items recurring and represented in ways that highlighted the statistical regularities. This facilitated infants' word learning by narrowing the range of items to be mapped on the words infants heard. Future research that takes into account the variability in how families arrange mealtime and examines cultural patterns of behavior and interaction around mealtime will provide further insights into culturally unique structures that facilitate word learning, as well as infants' and young children's learning about tools with caregiver guidance.

3.3.2 Household chores

Research has shown that infants start engaging in helpful behaviors at home by the time they are 12 months old (Dahl, 2015). Around 18 to 24 months of age, infants are shown to enthusiastically participate in a number of household endeavors including sweeping, setting a table, and putting away items in a laboratory setting (Rheingold, 1982). Infants' early involvement in household endeavors is tied to cultural ways of learning. For example, contributing to family and community activities is central to the LOPI system (Rogoff, 2014; see the section above, 3.2.2), and as such, children in communities that practice LOPI tend to contribute to household chores without being explicitly asked (Alcalá et al., 2021, 2014).

In many Indigenous communities of the Americas that practice LOPI, children as young as 2 to 3 years old have been shown to pitch in with initiative, contributing without explicit or implicit bids from others. Children of the same age who grow up in highly-schooled European-American communities also spontaneously help out with chores at home (Coppens & Rogoff, 2022). Yet, caregivers from these two cultural communities respond differently to children's intention and behavior of helping. In European-American middle-class contexts, caregivers tend to not value these contributions as "real" helping, seeing them as a nuisance. In contrast, the

families practicing LOPI tend to encourage and honor the contributions of small children (Coppens et al., 2020; Rogoff et al., 2020). The cultural variations in the pattern of caregiver responses to children's engagement with household chores may exert impacts on children's later contribution. By 6 to 7 years old, children engage in spontaneous help with household chores much less frequently in the European-American sample, whereas it remained common in the families that practice LOPI. This finding suggests that children learn about the value of contributing by being included in the context of household chores (Coppens & Rogoff, 2022). In fact, a study with older children found correlations between children's contributions to household chores and their tendency to care for others, again suggesting a link between engaging children in this activity and children's prosocial learning (Grusec et al., 1996). Furthermore, White et al. (2019) found links between children's household-chore participation at 5 years of age and their evaluation of their own social skills in third grade, similarly indicating that doing chores at home in early childhood may promote learning in the prosocial domain.

Several areas of cognitive development are connected to children's engagement in household chores. For example, there have been a few studies linking household contribution with mathematics skills in children in the U.S. and Zimbabwe (Tan et al., 2023; White et al., 2019). There are also potential links shown between contributing regularly to household chores and increased working memory and inhibition in children from 5 to 13 years old in the U.S. (Tepper et al., 2022). Finally, young children's engagement in household chores may offer the same benefits as object play as discussed the earlier section. For example, manipulating pots and pans as young children help with cleaning dishes may provide them with concurrent opportunities to engage in responsive communication with caregivers (Tamis-LeMonda et al., 2013) and chances to learn about the intended functions of objects (Rachawani et al., 2020). Household endeavors involve actions that require hand-eye coordination; they also provide a

cross-modal flow of information to children such as sounds derived from children's action on objects. Furthermore, household endeavors potentiate verbal and nonverbal communication with others when children carry out their actions. Thus, for children growing up in communities where early helping at home is valued or promoted, household endeavors constitute an important context for future research to specify cultural ways of action-based learning.

3.3.3 Book reading

Reading books and engaging in other literacy-related activities at home are associated with vocabulary development and reading success in school (Sénéchal & LeFevre, 2002). In middle-class and upper- to middle-class families, caregivers tend to provide many books in the home and start reading to infants when they are as young as 6 to 9 months old (Heath, 1982b; Sénéchal et al., 1996). Book reading with infants between 12 and 36 months of age has been correlated with expressive vocabulary, foundational reading skills like phonemic awareness, and later reading performance in school (Bus et al., 1995; Patterson, 2002; Raikes et al., 2006). This learning may be facilitated by the diverse vocabulary in picture books (Montag et al., 2015), the pragmatics of parental commentary during book reading (Tamis-LeMonda et al., 2012; 2019), and socialization into school-like ways of thinking about books, reading, and conversation (Heath, 1982b; Tamis-LeMonda & Song, 2012).

Much of the existing research on book reading focuses on its outcomes and less on examining the cross-modal process of learning during this activity. To highlight an example of the outcome-focusing research, Patterson (2002) examined the relation between book reading and vocabulary scores in bilingual toddlers from 21 to 27 months of age. The study consisted of a survey by which parents reported the frequency of book reading and TV watching in each of the two languages. Using standardized vocabulary measures, the study showed that more book reading in English led to higher English vocabulary scores, and more book reading in Spanish

led to higher Spanish vocabulary scores. Book reading was found to be responsible for 7% of variance in children's vocabulary scores in each language. TV watching, on the other hand, showed no correlation with vocabulary measures. This finding exemplifies decades of work showing a positive correlation between book reading and children's expressive vocabulary scores and emergent literacy skills. Of course, it is important to remember that book reading is not the *only* way to foster literacy and communication. Other cultural and familial practices, like oral storytelling, can also promote literacy skills (Miller et al., 2005; Tamis-LeMonda & Song, 2012; Wang et al., 2021). Beyond outcome measures, book reading and other language practices serve as a data-rich context for research as infants and young children coordinate listening, gaze, pointing while verbally contributing to the stories with caregivers in this activity. Combined with a cultural lens, researchers can take a deeper look into the process of and the mechanisms underlying cross-modal learning around books and other literacy materials.

3.3.4 Device-mediated activities

Although play with tangible objects is still prevalent in infants' and young children's lives, early play has started to include the use of electronic applications on touchscreen devices as a play medium in many families (Common Sense Media, 2017; Cristia & Seidl, 2015; Rideout & Robb, 2020). The shift towards increased digital play raises questions regarding how material types may affect caregiver-child interaction and children's learning and development (e.g., Huber et al., 2018; Radesky et al., 2015). Scholars have long underscored the vital role parents play in shaping children's experience with technology at home (e.g., Griffiths & Arnold, 2018; Konca, 2021; Livingstone, 2009; Livingstone et al., 2011; Nevski & Siibak, 2016) with some pointing out that parental guidance can alleviate certain risks of extensive use of digital materials by young children and provide potential opportunities for their development (e.g., Livingstone & Franklin, 2018). Research also showed that in digital activities at home, parents and young children frequently

interact with each other to resolve conflict, collaborate, or share experiences (Konca & Tantekin Erden, 2021). Together, these reports call for further research on how children's action-based learning may be shaped by device use.

Beside touchscreen play, another prominent device-mediated activity is video chat. Video-calling applications such as FaceTime, Google Hangouts, Skype, and Zoom are commonly used with infants under 24 months (McClure et al., 2015), which also raised concerns from caregivers and practitioners around increased screentime. The American Academy of Pediatrics (AAP) guidelines around screen time for infants under 18 months recommends that infants' media use should be "very limited, and only when an adult is standing by to co-view, talk, and teach" (American Academy of Pediatrics, 2022). However, AAP makes an explicit allowance for video chat for infants under 18 to 24 months of age (Hill et al., 2016).

Video chat can promote family connection over long distance, and the COVID-19 pandemic has accelerated the use of video chat with infants and young children when physical visits were prohibited or limited. Yet, there remains inadequate research regarding how caregivers and infants routinely engage in video chat in connection with verbal and nonverbal practices discussed in the previous section of this chapter. To provide some insights, Stroud, Wang, and Basch (2024) conducted a study to examine recurring strategies of caregivers to foster communication and social engagement in infants and young children during video chat, using recordings of naturalistic video-call sessions. Participants were children from 10 to 48 months old; their parents were asked to record video calls involving the child for the duration of their participation in the study. Two categories of guidance were coded for these recordings: conversation guidance (CG) and action guidance (AG). CG was defined as prompts given to elicit or confirm a verbal response by the child, for example, "say bye-bye," whereas AG was to elicit or acknowledge a nonverbal response, for example, "show me your teeth." Whether a CG or

an AG prompt was successful was judged by the child's completion of the prompted action or the child's demonstrating an attempt to do so.

Comparing 90-min samples of video chat from participants under 2 years old and over 2 years old, Stroud et al. (2024) found that all families engaged in CG and AG to varying degrees (see Table 2). For both age groups, there was an overall preference for the adults to use CG prompts over AG prompts. Developmentally, older children responded more reliably than younger children to both forms of guidance. The fact that infants under 2 years of age did not respond reliably to either CG or AG prompts to sustain communication during video calls is not surprising: Previous research has robustly shown that infants this year tend to have difficulty interpreting the visual and auditory information from the screen in similar settings as video chat (e.g., Troseth et al., 2007). Despite the challenges that infants under 2 might have experienced, the use of video chat remained consistently frequent in the participating families, and the adults were observed to be highly collaborative in scaffolding infants' and children's participation. Future research can examine variations in caregiver guidance in relation to culturally unique language practices. Diversifying the understanding of how video chat is used as a cultural tool will provide insights into different ways that action-based cross-modal learning may unfold in this increasingly prevalent activity for infants and young children.

4. Research approach recommendations

Each of the activity contexts reviewed in this chapter, including object play, provides a well-suited backdrop for systematic investigation of how action-based learning may occur in culturally relevant ways in infancy and early childhood. In the final section, we offer a few key points for considerations in conducting diversity-minded and culturally appropriate research on early action-based learning.

Cross-cultural research that compares beliefs and practices in fostering children's learning

has a tendency to characterize variations in dichotomous ways. For example, prior research tended to map European versus Asian pedagogical orientations onto one of the following dichotomies: autonomy versus compliance, independence versus interdependence, and individualism versus collectivism (e.g., Keller et al., 2007; Lin & Fu, 1990; Triandis, 1990). This approach offers a simple and linear divide, which encourages the comparison between cultural groups for the purpose of identifying what works better and thereby invites a deficit perspective of the “underperforming” group as lacking certain experiences. In a different approach, scholars shift from the dichotomous divide to specifying the cultural framework of learning for a given community, thus placing culture front and center when considering how early learning through action is organized in children’s cultural community. In doing so, comparing a focal community with another group is done for the purpose of reflecting culturally unique ways of fostering early learning rather than judging which way works better. For example, the LOPI model by Rogoff and colleagues, as mentioned in the previous sections, provides a framework of analysis for children’s cultural experiences with learning and specifies how these experiences are organized by many Indigenous communities of the Americas (e.g., Coppens et al., 2014; Paradise & Rogoff, 2009; Rogoff, 2014; Rogoff, Mejía-Arauz, et al., 2015). Their work often includes a different cultural group to reflect the uniqueness of a given practice and identify potential strengths for learning that could be fostered through a particular practice, while acknowledging that different practices foster different strengths. We recommend future research to leverage this culture-centered approach, steering away from deficit narratives of cross-cultural comparisons.

In a similar vein, we recommend future research to look beyond the outcome measure to identify diverse ways of building strengths for learning in infants and young children from different backgrounds. Important developmental mechanisms have been identified by addressing equifinality—to look beyond similar outcome performances—as demonstrated in research on

language development by infants and young children (e.g., Burling & Yoshida, 2019; Sperry et al., 2019; Yoshida, Cirino, Mire, & Burling, 2019; Yoshida, Patel, & Burling, 2019). For example, Sun et al. (2022) showed that parents of monolingual and bilingual infants in a Texas city provided a similar level of coordinated learning moments in which parents aligned their spoken words or phrases temporally with infants' attention to the focal object. These temporal alignments eased word-object mapping for young learners. Crucially, Sun et al. (2022) found that similar levels of coordinated learning moments were amassed across the monolingual and bilingual groups, through different profiles of parental verbal input such as varying numbers of words parents spoke. Their finding demonstrated different ways in which parents could provide infants with similar levels of developmental support.

Our final recommendation reflects limitations of experimental and quantitative methods in addressing research questions around cultural aspects of learning. Experimental research must go beyond linguistic equivalence (e.g., beyond the precise translation of instructions for participating parents) and procedural standardization to actively interrogate the assumed legitimacy for making comparisons of observed behavior across cultural groups. For example, when comparing maternal guidance for infants' hands-on learning across Chinese-speaking families in Taipei, Taiwan and English-speaking families in Santa Cruz, California, U.S.A. in an experiment, Wang (2024) observed that the mothers interpreted the seemingly identical instructions (given in their language) in different ways. This was not surprising as parental interpretation of the instructions and the study context is derived from the broader system of cultural practices, which may differ across the two groups. However, the different interpretations could not have been detected if the research design did not include a debriefing interview that allowed the mothers to reflect on their responses to the study procedure and share their rationale underlying the guidance they just provided to the infants. This case exemplifies how qualitative methods can advance the

contribution of research when combined with experimental and quantitative methods.

Qualitative analysis of caregiver, child, and dyadic behaviors can supply important evidence and layers of considerations to delineate the complexity in cultural meanings that underlie the observed behavior. Qualitative methods complement quantitative research by offering “thick descriptions” that elaborate on and explain observations (Power et al., 2018, p. 366). In addition, qualitative methods highlight the perspective of participants from a given cultural community and capture the lived experiences of participants in ways that are often difficult with experimental methods (Gergen et al., 2015; Willig, 2019). Innovative combination of experimental, quantitative designs with qualitative tools and analyses can be generative for integrating the individual aspect of learning with the dyadic and cultural aspects of learning. For example, video-cued interviews can be a useful tool to reveal cultural ideologies behind caregiver-child interaction, at home or in laboratory settings, allowing researchers to make sense of the variations observed. This tool, modeled after the *Preschool in Three Cultures* research series (Tobin, 2019; Tobin et al., 1989, 2009), involves showing participants video clips of cultural practices (e.g., mother-child interaction) and asking for their thoughts and opinions on the videos. By giving participants something concrete to reflect on and discuss, video-cued interviews allow researchers to reveal cultural ideologies that are often hard for participants to describe (Rogoff, 2003). Another approach is to complement quantitative analyses with a qualitative case study. For example, placing two cases side-by-side with a microanalysis of moment-to-moment caregiver behavior, infant behavior, and the relation between the two will elevate the saliency of cultural variations in otherwise similar situations (Table 3, Zhang et al., 2021). The qualitative comparison at the micro level will also allow researchers to take a more acute look at fine-grained aspects of culturally unique practices.

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Table 1. *Definitions and examples of the four types of questions observed in Basch et al. (2024)*

Type of Question	Definition	Examples
Many-possible-answers	Parent asks an open-ended question about how to do the activity to which there are multiple reasonable answers . These questions are often open-ended questions about how the child is thinking about the task.	<i>What are you going to do next?</i> <i>What should we do first?</i> <i>How are we gonna make the square red?</i>
One-right-answer	Parent asks the child a question to which there is ONE correct (expected) answer . When parents ask this type of question, they are often searching for a physical description.	<i>Does the red go under the blue or on top?</i> <i>What color piece do you see here?</i> <i>Where does the bunny go?</i>
Instructive	Question statement that functionally directs the child about the right way to do the puzzle (or what not to do). Parent expects no verbal response from the child.	<i>That block should go here, right?</i> <i>What about like this?</i> <i>What if we...?</i>
Check-in	Parent asks these questions to check in with the child about how they are doing. These questions are not meant to help the child know what to do next. Rather, they seem to keep the conversation progressing or gauge how the child is doing.	<i>All done?</i> <i>Do you understand?</i> <i>You put him in there, huh?</i>

Table 2. Proportions and success rates of conversation guidance (CG) and action guidance (AG) during video calls observed in Stroud et al. (2024)

Measures	<u>Younger Children</u>	<u>Older Children</u>
	<i>M (SD)</i>	<i>M (SD)</i>
CG prompts	64.2% (17.3%)	69.7% (2.7%)
Successful CG	39.7% (21.3%)	77.6% (8.0%)
AG prompts	35.6% (17.1%)	30.3% (2.7%)
Successful AG	53.8% (40.3%)	80.9% (18.8%)

Table 3. A side-by-side comparison of mother-infant interactions shown in Zhang et al. (2021)

	<p>Baby Hui (B) brought over the shape object to mouth it. The mother (M) held B on her lap.</p>		<p>Baby Alex (B) brought over the shape object to mouth it. The mother (M) held B on her lap.</p>
	<p>Within 2 s, M positioned herself to B's left and began to pull the object away from B's mouth.</p>		<p>B knocked the shape against the table and looked around. After 5 s, M pointed at the opening and said "put it in there, can you do that?"</p>
	<p>B held on to the shape object while M tried to pull it away and said "do not eat (it)." Next, M removed the object out of B's hands.</p>		<p>B knocked the shape against the table again, and then clapped hands with it. M smiled, leaning forward to kiss B.</p>
	<p>M placed the object in front of B, who reached for it. M pulled B's hand back and held his other arm, while tapping the object and said "look at this one, here."</p>		<p>M waited for 10 s before holding B's right arm in the attempt to move the shape object closer to the opening. B resisted hand holding by dragging his arm downward.</p>
	<p>B picked up the object and attempted to insert it into the toy, while M held his hand to facilitate the action by positioning the object in the opening.</p>		<p>M withdrew her hand immediately. Finally, she moved the toy closer to B and leaned back to watch B explore the toy set.</p>